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ABSTRACT

This document focuses on spending for national research and development. Data were compiled from information on research and development (R&D) activities collected through individual sector surveys conducted as part of a comprehensive program to measure and analyze the nation's resources for research and development. Data are reported about changes in the national R&D effort, projections for future U.S. R&D spending, the character of R&D work, and employment of R&D scientists and engineers. (PB)

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SCIENCE RESOURCES STUDIES

HIGHLIGHTS

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National R&D Spending Expected to Exceed \$57 Billion in 1980

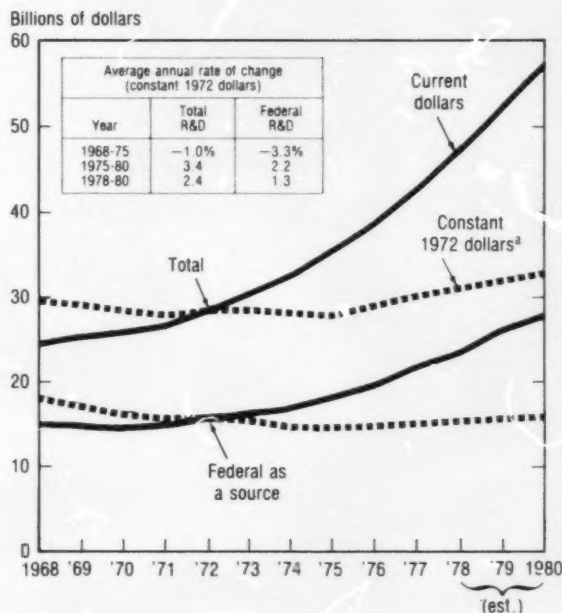
Assessment Highlights

- Constant-dollar gains in the national R&D effort have occurred each year since 1975, after nearly 10 years of no growth in real dollars. This growth has resulted in large part from increased emphasis on finding alternative sources of energy. Between 1975 and 1978 energy accounted for nearly one-third of the increase in R&D spending while, at the same time, amounting to less than 10 percent of the national R&D effort.
- In 1979 and 1980 the proportion of R&D spending funded by the Federal Government is expected to continue to decrease to slightly less than 50 percent. This is the first time since the collection of R&D statistics began in 1953 that the ratio of Federal support will have fallen below 50 percent. In 1968, for example, the Government supported over 60 percent of the Nation's R&D effort. Federal defense and space cutbacks have occurred and civilian R&D programs, particularly energy, have received increased emphasis, starting in the midseventies.
- Since 1975 both research and development funding have increased at the same rate, indicating no change in the relative emphasis between R&D activities that are likely to produce longer or shorter term returns. Within the research total, however, there has been a general trend of allocating proportionately more funds into basic research. This trend has resulted in large part from recent administrations' policies of strengthening the Federal basic research effort. At present, the Government supports about two-thirds of the Nation's basic research and one-half of the applied research.
- In 1977 more full-time-equivalent (FTE) R&D professionals were employed in the United States than in any previous year. Since 1975, FTE employment of R&D scientists and engineers has shown significant growth. Based on the increases expected in real R&D spending through 1980, continued increases in the FTE employment of R&D scientists and engineers should result with the largest absolute increase in industry.

Data Highlights

- Total U.S. R&D spending is projected to reach a current-dollar level of \$57.3 billion in 1980, an increase of 9 percent over the 1979 expected level. In constant dollars, national R&D spending is expected to increase by 2 percent between 1979 and 1980. Since 1975 national R&D spending in real terms has increased by nearly 20 percent. This followed a 10-year period in which R&D spending in constant dollars recorded no growth.
- Research and development is expected to account for 2.2 percent of the Nation's gross national product (GNP) both in 1979 and 1980. This ratio de-

National R&D expenditures: 1968-80

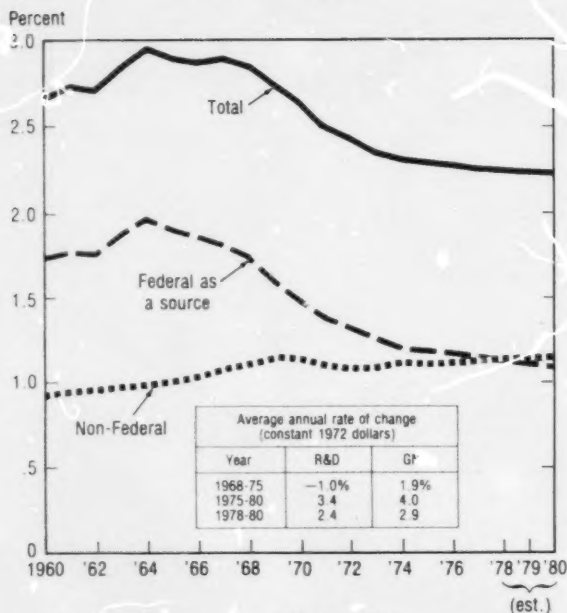


^aBased on GNP implicit price deflator. Assumes an 8-percent increase in this deflator between 1978 and 1979 and a 7-percent increase between 1979 and 1980, as estimated by the Office of Management and Budget.
SOURCE: National Science Foundation

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R&D/GNP: 1960-80



SOURCE: National Science Foundation and Department of Commerce

clined steadily from its 1964 peak of 3.0 percent to a 1973 level of 2.3 percent. Since 1973 it has remained relatively level. Based on R&D funding and GNP projections into the eighties, this ratio should remain at about its present level into the near future.

- About 35 percent of the R&D effort in the United States is devoted each year to research. In 1980 this is expected to amount to \$20.3 billion. Of this, total basic research spending will reach \$7.4 billion and applied research \$12.9 billion. These levels represent increases of 11 percent and 10 percent, respectively, over 1979. Development spending in 1980 is expected to amount to \$37.0 billion, an increase of 9 percent over 1979.

R&D Support

The real increases in U.S. R&D spending that began in 1976 are expected to continue during 1980 with both Federal and non-Federal support registering significant growth. The largest R&D growth over this period occurred with industry's own R&D funds—nearly 25 percent in real terms.

The Federal Government is expected to furnish \$27.9 billion for R&D activities in 1980, 8 percent more than in 1979. In constant dollars the increase will be 1 percent. This will mark the fifth consecutive year that Federal R&D support is expected to increase in real terms. Even though the Federal Government has increased its R&D support in real terms in recent years, its share of the national R&D total has continued to drop. In 1980 the Federal Government is expected to finance less than

one-half of the national R&D effort; in 1966 the Government financed over three-fifths of the total. After this time, Federal defense and space R&D funds were reduced. Beginning in 1976, Federal R&D funding began to increase in real terms, following in large part the growing national emphasis on energy development and conservation. Based on data shown in "Special Analysis L" of the U.S. 1980 Budget,¹ however, Federal R&D increases are expected to shift back toward defense and space activities in 1980.

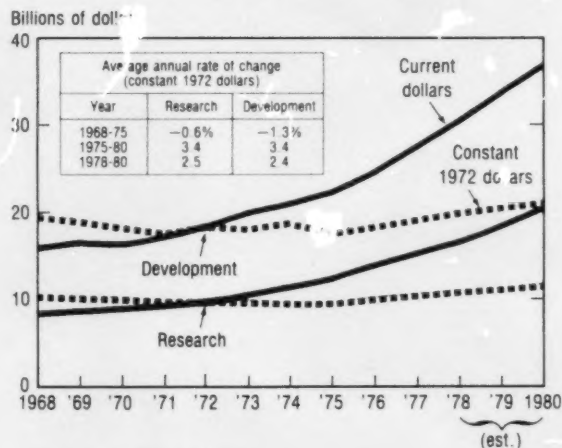
Non-Federal R&D support has continued to increase at a faster rate than Federal R&D spending since the midsixties. This trend is expected to continue into 1980 with non-Federal R&D spending increasing 4 percent over 1979 in real terms, compared with Federal R&D support of 1 percent. Over 90 percent of non-Federal R&D funds are provided each year by industry. Industrial R&D rate of funding has kept pace with increases in sales and has been stimulated by energy and environmental concerns.

Character of R&D Work

In 1980 total research spending in current dollars in the United States is expected to reach \$20.3 billion, an increase of 10 percent over 1979; development spending should reach \$37.0 billion, an increase of 9 percent over 1979. Since 1975 both research and development spending have increased at about the same average annual rates. Over this period the Federal Government has emphasized research, particularly basic, and industry's company R&D funds have shifted toward shorter term applied research and development work.

¹Office of Management and Budget, *The Budget of the United States Government, 1980, "Special Analysis L"* (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, January 1979).

National research expenditures as compared with development expenditures: 1968-80



SOURCE: National Science Foundation

Funds for research and development: 1975-80
[Dollars in millions]

Year	Total	Government	Industry ¹	Academic sector		
				Universities and colleges	Associated FFRDC's ²	Other nonprofit institutions ³
By performer						
1975	\$35,200	\$ 5,397	\$24,164	\$3,409	\$ 987	\$1,243
1976	38,848	5,710	26,938	3,730	1,147	1,323
1977	42,914	6,142	29,907	4,064	1,384	1,417
1978 (est.)	47,430	6,450	33,500	4,585	1,375	1,520
1979 (est.)	52,440	6,800	37,700	4,965	1,425	1,550
1980 (est.)	57,270	7,300	41,350	5,450	1,500	1,670
By source						
1975	\$35,200	\$18,152	\$15,787	\$ 750	—	\$ 511
1976	38,848	19,644	17,620	821	—	563
1977	42,914	21,775	19,625	893	—	621
1978 (est.)	47,430	23,650	22,080	1,000	—	700
1979 (est.)	52,440	25,900	24,675	1,110	—	755
1980 (est.)	57,270	27,900	27,325	1,225	—	820

¹Expenditures for federally funded research and development centers (FFRDC's) administered by this sector are included.

²FFRDC's administered by individual universities and colleges and by university consortia.

SOURCE: National Science Foundation

National basic research spending is expected to reach \$7.4 billion in 1980, up 11 percent from the 1979 level. Almost 70 percent of the Nation's basic research is funded by the Federal Government. Since 1975 Federal basic research support has increased by nearly two-thirds; in constant-dollar terms this represents an increase of about 20 percent. Although industry has been devoting a somewhat larger share of its company R&D funds each year to shorter term applied research and development work, its basic research support has still been increasing mainly in energy-related areas. Since 1975 industry's own-funded basic research in real terms has increased by 20 percent. This follows a 10-year period where industry's company-funded basic research decreased by 20 percent.

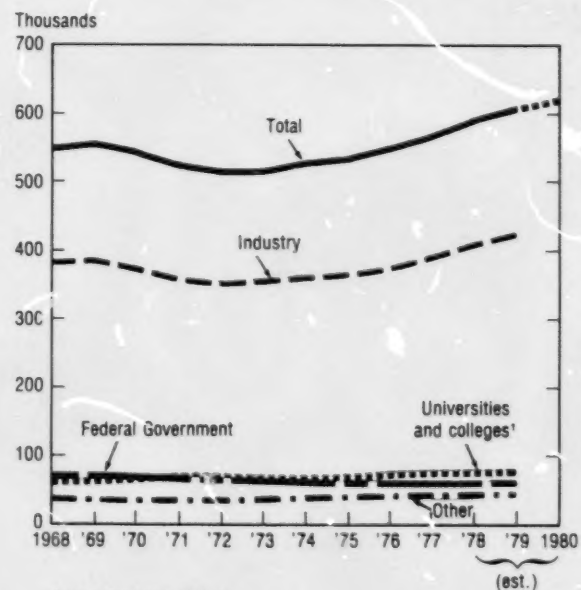
National applied research spending is expected to reach \$12.9 billion in 1980, an increase of 10 percent over 1979. In real terms, Federal applied research support has remained level since 1976. Since that time, all major Federal agencies except the National Aeronautics and Space Administration (NASA) have increased their applied research support; NASA's support has decreased by some 15 percent in real terms. Non-Federal applied research support has increased some 20 percent since 1976, primarily because of increased industrial funding.

R&D Scientists and Engineers

In 1977 the full-time-equivalent (FTE) of 572,000 scientists and engineers was employed in the United States on R&D activities. The FTE number of R&D professionals has been increasing each year since 1973 when 518,000 were employed. Based on the expected increases in real-term R&D spending between 1977 and 1980, it is anticipated

that the employment of FTE R&D scientists and engineers will continue to increase to 625,000 by 1980. All sectors of the economy are expected to share in the increase with the largest absolute growth to occur in industry, particularly in those industries with a heavy reliance on engineering skills.

Full-time-equivalent R&D scientists and engineers by sector: 1968-80



¹Excludes associated FFRDC's
SOURCE: National Science Foundation

These data were compiled from information on R&D activities collected through individual sector surveys conducted as part of a comprehensive program to measure and analyze the Nation's resources for research and development. More detailed data will be published in a report entitled *National Patterns of Science and Technology Resources, 1953-80* to be available in the spring of 1980 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. A limited number of copies of the detailed statistical tables from the forthcoming report will be available on request in the summer of 1979 from the Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550.



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